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ABSTRACT

The University of Rhode Island's International Engineering Program leads to two degrees: a B.A. in German and a B.S. in engineering. A major problem in program development was lack of appropriate instructional materials and recommended methodology for technical German courses. An instructional unit on the diesel motor illustrates how materials were selected, combined, and presented and how challenges were met. Technical texts, a German pictorial dictionary, German books for young people, exercises from a German grammar book, and a short videotape recording on Rudolf Diesel were used to develop interest and a willingness to discuss technical topics, and to practice language skills and vocabulary. When two students claimed to have found an error in a text, other students began a lively discussion. The guidelines followed in preparation of the unit included: (1) selecting as many authentic teaching materials as possible, but not at a discouragingly difficult proficiency level; (2) supplementing all reading material with charts, graphs, and pictures to facilitate comprehension; (3) using students' prior knowledge, in this case from a previous textbook; (4) finding the right grammar and vocabulary level; (5) providing students with a grammatical foundation; and (6) not exceeding 9 class hours per unit. (MSE)

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TEACHING FOREIGN LANGUAGES TO ENGINEERING STUDENTS: CHALLENGES AND PROBLEMS

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While the combination of the study of foreign languages with business administration is fairly well established at many institutions of higher education in the United States, the interaction between foreign languages and engineering departments is still in its initial stages nationwide.

In trying to meet the demands of the international marketplace for linguistically educated engineers, the University of Rhode Island entered this new and non-traditional field in foreign language instruction by establishing the International Engineering Program (IEP); a five-year program combining the study of German and engineering and leading to two degrees: a B.A. in German and a B.S in engineering. Students in this program develop skills in the German language and intercultural communication while preparing for their engineering careers, and spend six months abroad in a professional internship.

With the support of a large grant from the U.S. Department of Education, the German Section is able to offer small, separately taught courses for the students in our program. We were able to attract students from all engineering fields, i.e. mechanical, electrical, civil, industrial, environmental and chemical engineering students. Currently, the IEP has approximately 60 students enrolled.

In comparison to the traditional German courses offered at the University of Rhode Island, the German courses for the International Engineering Program do not only consist of teaching communicative competence and imparting knowledge of German culture and society, but also provide a basis for the comprehension of technical German.

One of the major problems we encountered in the past was the almost complete lack of appropriate teaching materials and suggested methodological approaches for these technical German courses. Because of this deficiency, we systematically sorted out the limited number of texts that were available and added newly discovered engineering material which we adjusted to the different course levels.

Using as an example an instructional unit on the diesel motor, which I compiled for the second year students in our IEP from a variety of sources, I would like to discuss the materials used, the methodologies applied, the challenges met, and the problems encountered. This will lead to a presentation of some general guidelines on how to implement technical materials in the foreign language classroom.

We started our series of technical topics with the diesel motor because the students already had some prior knowledge of the history of the automobile and vocabulary pertaining to the automobile from their first year-textbook Grundkurs Deutsch (Schäpers/Luscher/Glück, Verlag für Deutsch München 1980). Another reason was the availability of two texts taken from Aus moderner Technik und Naturwissenschaft by Zettl, Janssen und Müller (Hueber Verlag München, 1983). One dealt with the introduction of the diesel motor in passenger cars, the other dealt with its method of operation. However, before jumping into the reading of these texts, I was looking for a gradual lead-in into this instructional unit. I found this in the DUDEN-Bildwörterbuch, a standard German dictionary in which words are defined solely through pictures. It is not only much easier but also more expressive to visually depict technical terms than trying to explain them in a written definition. I selected the picture of a car with all its parts numbered and added a list of vocabulary with those parts and components that I thought to be important and interesting for the students to know. Then, I asked them to identify and match these. (Folie 1) The students felt as if they were back in Junior High, and had a lot of fun doing this exercise. Although they hardly knew any of the vocabulary on the list, they were able to infer many of them, and it turned out to be like a competition of who finished first. Thus, I did not only have a playful introduction to the topic, but could also provide them with some cultural information on the differences between a German and American built car, i.e. the US-required tail light, the extra tank seal, the great variety of buzzers, etc.; some of the differences that I had noticed when first entering to the United States.

Before getting into the details of how this motor works, I thought it was important for them to know about the inventor of the diesel motor. Hence, the next assignment for them was to go to the library and find information on Rudolf Diesel: the man, his life, his various experiments and the public's reaction to his great invention. The information found should then be presented in the form of a short essay. This exercise introduced them to basic library work; an experience engineering students are rarely exposed to. In addition, it provided them with more cultural information, and furthered their writing skills.

After these two short introductory exercises, we started to work on one of the texts on the diesel mentioned above. Since it was their very first encounter with a technical text, it had to be relatively simple and not too long. The text dealt with the application of the diesel motor for passenger cars, and its pros and cons in comparison to a regular combustion engine. The content of the text was not too technical, but acquainted them with some of the vocabulary they needed to know for the assignments to follow. It was written in short sentences, using the present tense only. The reading of the text was followed by comprehension exercises and lead to a lively discussion on the diesel's pros and cons, in that way reinforcing the vocabulary and practicing their oral argumentative skills.

The next short reading passage served as an introduction to the technical aspects of the diesel motor. It is taken from a book of the series called Was ist Was?; a series of books for young people on a large variety of topics, such as dinosaurs, the Ice Age, stamps, insects, but also astronomy, mathematics, chemistry and physics. Since I found the original reading passage to be too difficult, I modified it slightly without changing its authentic character. The text asked the question: Why doesn't the diesel motor need spark plugs? It was their exercise, not only to read this text, but then to answer this question, using their own words as much as possible.

Since the readers of the book, where I found this text, are 8 - 14 year old boys and girls, its texts include conversational German, here adjective intensifiers, i.e to be as wet as a poodle, meaning soaking wet, or to be as tall as a tree, meaning very tall. These expressions are very colloquial and the discussion of their derivation reveals a lot of cultural information. In order to expand their knowledge of German colloquialisms, I looked for and found a whole list of intensifiers in a book on German grammar games (Lauster, Ursula, Grammatikspiele für das dritte bis fünfte Schuljahr, Ensslin & Laiblin Verlag Reutlingen 1984), originally designed for children in elementary school, using a lot of pictures. (Folie 2) Again, I asked the students to guess the word, and it was a lot of fun to listen to their guesses. However, I chose this exercise not only to give the students a further insight into German culture, but also to show them that by taking our special engineering German course, they do not miss out on learning the spoken language. Thus, this second text exposed the students to both, more basic technical and conversational vocabulary; it started them talking about technical aspects, and, in addition, gave them more German cultural background.

With the next part of this instructional unit on the diesel motor, we delved into its technical details: this text is taken from the book by Zettl et. al. mentioned above. Since engineers very much enjoy interpreting graphics and pictures, we started by merely looking at the labeled pictures. (Folie 3) Using their prior knowledge in their engineering field, they had to explain its method of operation, applying the vocabulary studied so far. Thus, the students whose field was not mechanical, but for example chemical or environmental engineering, were helped by their expert fellow students, all in German, of course. By using this method, the students were already geared towards the content of the subsequent text, thus facilitating its comprehension.

While they mostly used basic first year-verbs such as 'to have', 'to be', 'to get', 'to go' in order to describe the pictures at first, they can now, after reading the text, expand their knowledge of verbs used to explain those kinds of technical processes. This was best done by analyzing the verbs used in the reading passage. These verbs then had to be applied by explaining and correcting a graphic that incorrectly depicted the diesel motor's method of operation. (Folie 4) In order to do that, they also needed to review the use of the grammar construction "not ..., but rather".

During the discussion on the diesel's method of operation, two students claimed that the text gave an incorrect explanation concerning the timing of the injection of the diesel into the piston. Being a language teacher without extensive knowledge in the field of mechanical engineering, I felt I was in a jam, since this problem never occurred to me during my preparation; text and graphics had seemed perfectly logical in my mind. Fortunately, other students helped me out by starting a discussion on that question which turned out to be so lively that I was more than glad that it was brought up. However, I was relieved that the two students who had initiated this discussion had been wrong.

To sum up, it can be said that this reading passage served several purposes and met important requirements: first, it used most of the vocabulary introduced in the preceeding texts, thus applying the students' most recently studied vocabulary and combining this with their prior knowledge within their field of engineering. Second, it included pictures, which is a traditional medium in the field of engineering. Third, it did not only practice their reading skills, but also strengthened their ability in oral expression, and fourth, it exposed them to a review of certain grammar structures common to most technical texts, such as the verb-first construction and the passive voice.

This text was followed by a short vocabulary game, in which the students had to find all the words that were hidden in a chart of letters. This also took on the character of a contest, and was an enjoyable activity. (Folie 5)

In order to summarize this unit, but also in order to train the students' listening comprehension and to provide more authentic material, I included a short video on Rudolf Diesel and his engine which was produced by Internationes on the occasion of his 125th birthday. Not only was Diesel's life outlined, but it also showed the original diesel motor and explained its method of operation, thus summarizing the topic by encompassing all the aspects covered in this unit, namely technical, linguistic, grammatical, cultural and social aspects.

In compiling and teaching the unit on the diesel, I tried to apply the following guidelines, and I feel that these could be useful in adapting any technical subject for use in technical language instruction.

First of all, one should try to select as many authentic materials as possible, however, not at the expense of discouraging the students by its difficulty. As sources for reading material, I experienced that technical books written for young teenagers are very useful; also, I suggest looking in the business sections of newspapers and magazines for articles covering engineering topics. The materials cover a wide range of topics and also vary in their linguistic complexity, to the advantage that they can be used at different course levels. However, most texts will need simplification and adaptation to their new purposes.

Second, all reading material should be supplemented as much as possible by graphics, charts and pictures, not only in order to adopt a medium of the field of engineering, but also to facilitate the comprehension of the text. It also invites the students to come and page through these books. In order to encourage that, we have set up a study room for our international engineering students. It has the character of a small open stack library with all the various books and technical dictionaries that we recently acquired for the program. It is also equipped with Macintosh computers, a medium that helps to take repetitive grammar drills out of the classroom, thus leaving more time for communicative activities.

Third, concerning the selection of topics covered, we experienced it to be very important to consider and include the students' prior knowledge of a subject. It is known that there is a strong relationship between prior knowledge, topic interest and future comprehension. In our case, all students showed strong interest in the diesel motor, although many of them were not within the field of mechanical engineering, hence had low prior knowledge. The lack of extensive prior knowledge of a topic must not necessarily reflect on the students' topic interests, but both, prior knowledge of and interest in a topic will enhance its comprehension. Therefore, we recommend including suggestions by the students along with the availability of material, especially when the writing of the curriculum is still in its initial stages. However, our main purpose is not the instruction of technical knowledge, but teaching technical and conversational language, which means that we have to concentrate more on the linguistic rather than these psychological factors mentioned above. These topics serve as important tools; and just as an equation with two variables cannot be solved, it is dangerous to select a topic in a foreign language that the students are not even familiar with in their own mother-tongue.

Fourth, as it is the students' first encounter with longer reading passages in general, and technical texts in particular, it is essential to the success of these courses to find the right level of difficulty concerning the grammar covered and vocabulary introduced. Although it very much depends on the material available, I discovered that it is most effective to concentrate on one major grammar problem per instructional unit.

Fifth, in addition to grammar and vocabulary, it is necessary to provide the students with basic skills and abilities to approach any technical text, i.e. guidelines on how to analyse sentences, how to divide the text into paragraphs and construe the textual structure, and how to correlate pictures, charts and diagrams with the text.

Sixth, I found the time span in the planning of instructional units very significant for their success, the students' interest and work attitude. In my experience, each unit should not exceed 9 class hours (which at URI corresponds to three weeks) if taught within a regular 12 to 14 week semester course. However, I will extend the number of hours for this unit's implementation in a German course for engineers offered at the German Summer School of the Atlantic; an intensive immersion program at the University of Rhode Island.

These six general guidelines, deduced through my experience with the unit on the diesel motor, I applied successfully to compiling other instructional units for the second year. These contain the different forms of energy generation, magnetics and environmental problems in the FRG, and thus also cover the various fields of engineering represented in our International Engineering Program.

We feel that courses covering content based material as presented above are an important and necessary addition to traditional language courses discussing short stories by Grillparzer and Kafka. The success of these courses within our International Engineering Program demonstrates that the introduction of content area reading to the foreign language classroom not only enhances the students' interest in the language but also meets their needs as future bilingual engineers.